查询SG6849-100D供应商

Low-Power Green-Mode PWM Flyback Power Controller without Secondary Feedback **SG6849**

FEATURES

- Linearly Decreasing PWM Frequency
- Green-Mode under Light-Load and Zero-Load Conditions
- Constant Voltage (CV) and Constant Current (CC)
- No Secondary Feedback
- Low Startup Current (5uA)
- Low Operating Current (3.6mA)
- Leading-Edge Blanking
- Constant Power Limit
- Universal AC Input Range
- Synchronized Slope Compensation
- 150°C OTP Sensor with Hysteresis
- V_{DD} Over Voltage Clamping
- Cycle-by-Cycle Current Limiting
- Under Voltage Lockout (UVLO)
- Fixed PWM Frequency (65kHz/100kHz)
- Gate Output Maximum Voltage Clamped at 16.7V
- Small SOT-26 Package

APPLICATIONS

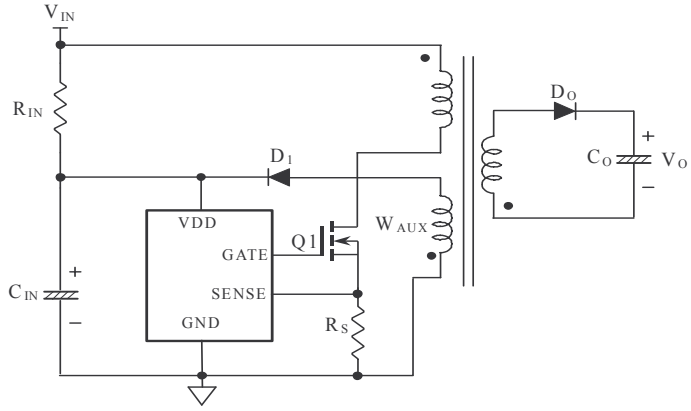
Low-power flyback power converters, such as

- Battery chargers for cellular phones, cordless phones, PDAs, digital cameras, and power tools.
- Power adapters for ink jet printers, video game consoles, and portable audio players.
- Open-frame SMPS for TV/DVD standby and other auxiliary supplies, home appliances, consumer electronics, and PC 5V standby-power.
- Replacements for linear transformers and RCC SMPS.

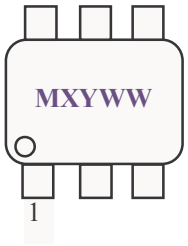
DESCRIPTION

This highly integrated PWM controller provides several features to enhance the performance of low power flyback converters. To minimize standby power consumption, the proprietary green-mode function provides off-time modulation to linearly decrease the switching frequency under light-load and zero-load conditions. This green-mode function enables the power supply to easily meet international power conservation requirements. The supply voltage V_{DD} is also used for feedback compensation, to regulate the output voltage without requiring a conventional TL431 and a photo-coupler. Another advantage of the SG6849 is that the typical startup current is only 5uA, while the typical operating current can be as low as 3.6mA. A large startup resistance could be used to achieve even higher power conversion efficiency. Built-in synchronized slope compensation maintains the stability of peak current-mode control. Proprietary internal compensation ensures constant output power limiting over a universal range of AC input voltages, from 90VAC to 264VAC.The SG6849 provides many protection functions. Pulse-by-pulse current limiting ensures a constant output current, even if a short circuit occurs. Also, the internal protection circuit will disable PWM output, if V_{DD} exceeds 22.7V. The gate output is clamped at 16.7V to protect the power MOS from over-voltage damage. The built-in over temperature protection (OTP) function will shutdown the controller at 150°C with a 20°C hysteresis. The SG6849 is designed to provide a low-cost total solution for flyback converters. It is available in a small footprint, 6-pin, SOT-26 package.

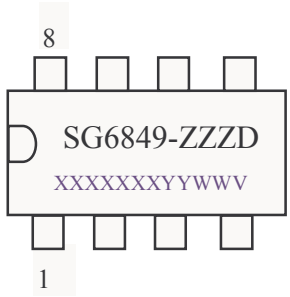
TYPICAL IC APPLICATION



MARKING INFORMATION

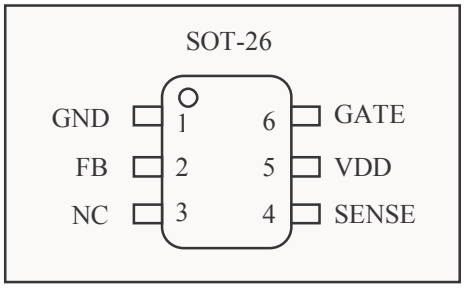


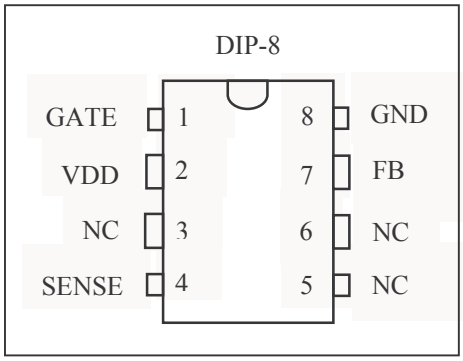
M: Mask Version
X: B= SG6849-65T
C= SG6849-100T
Y: Year
WW: Work Week



ZZZ: 65 or 100
XXXXXXX: Wafer Lot
YY: Year
WW: Week
V: Assembly Location

PIN CONFIGURATION





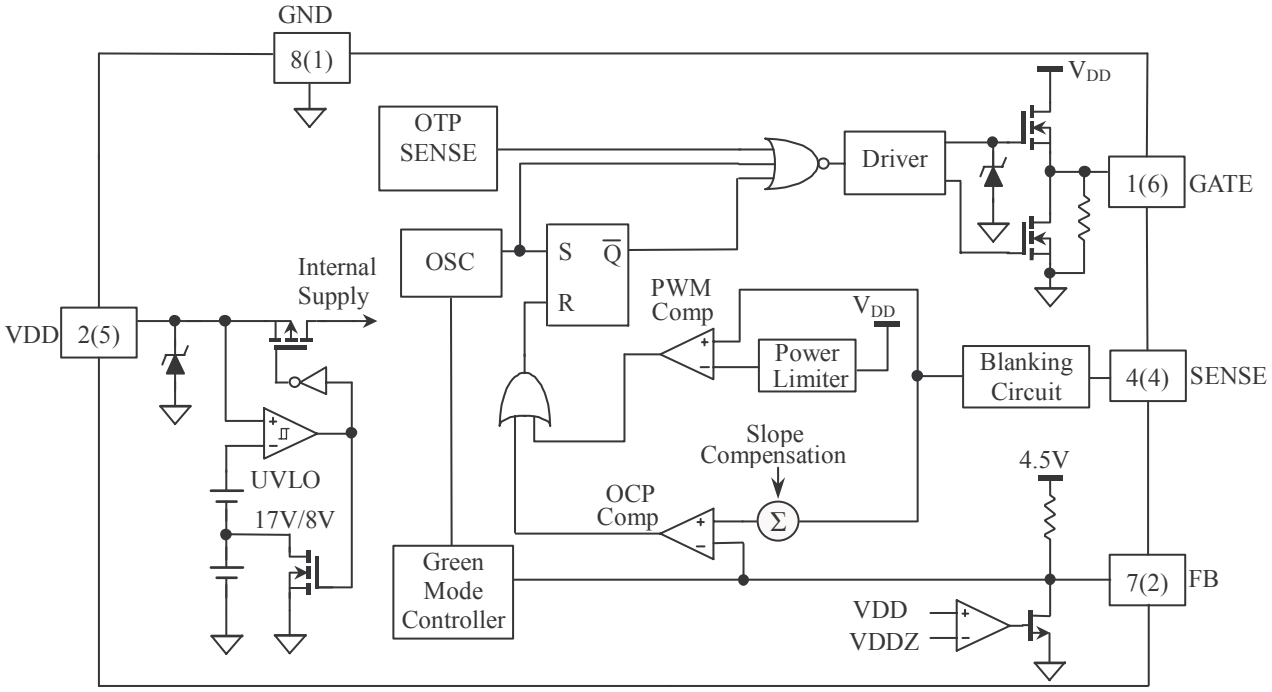
ORDERING INFORMATION

Part Number	PWM Frequency	Package
SG6849-65T	65kHz	6-Pin SOT-26
SG6849-100T	100kHz	6-Pin SOT-26
SG6849-65D	65kHz	8-pin DIP-8
SG6849-100D	100kHz	8-pin DIP-8

PIN DESCRIPTIONS

Name	Pin No.		Type	Function
	DIP-8	SOT-26		
GATE	1	6	Driver Output	The totem-pole output driver to drive the power MOSFET.
VDD	2	5	Supply	Power supply.
NC	3	NA		NC pin.
SENSE	4	4	Analog Input	Current sense. It senses the voltage across a sensed resistor. To provide over-current protection, PWM output is disabled if the voltage exceeds an internal threshold. This pin also provides current information for current-mode control.
NC	5	3		NC pin.
NC	6	NA		NC pin.
FB	7	2	Analog Input	Feedback. The FB pin provides feedback information to the internal PWM comparator. This feedback is used to control the duty cycle. When no feedback is provided, this pin is left open.
GND	8	1	Supply	Ground.

BLOCK DIAGRAM



DIP-8(SOT-26)

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{DD}	DC Supply Voltage* Zener Clamp Zener Current		25 30 10	V V mA
V_{FB}	FB Pin Input Voltage		-0.3 to 7	V
V_{SENSE}	Sense Pin Input Voltage		-0.3 to 7	V
P_D	Power Dissipation		300	mW
$R_{\theta JA}$	Thermal Resistance (Junction to Air)	SOT-26 DIP-8	243.3 113.0	°C/W
$R_{\theta JC}$	Thermal Resistance (Junction to Case)	SOT-26 DIP-8	115 67.1	°C/W
T_J	Operating Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to +150	°C
T_L	Lead Temperature (Soldering)	20 sec SOT-26 10 sec DIP-8	220 260	°C
	ESD Capability, Human Body Model		3.0	kV
	ESD Capability, Machine Model		300	V

**All voltage values, except differential voltages, are given with respect to the network ground terminal.*

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	<22.7	V
T_A	Operating Ambient Temperature	-30 to +85	°C

ELECTRICAL CHARACTERISTICS (V_{DD}=15V, T_A=25°C)

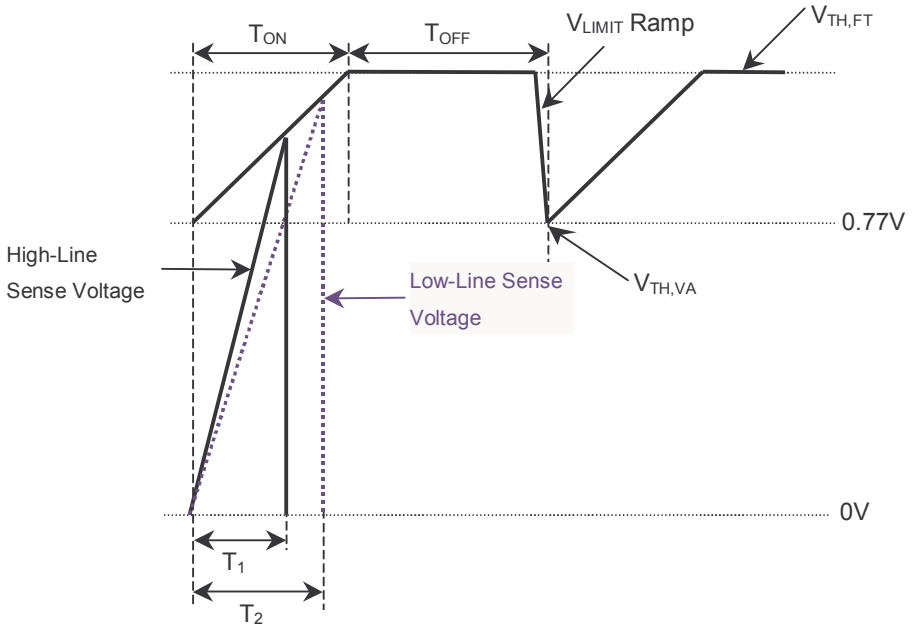
Feedback Input Section

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{OZ}	Zero Duty-Cycle FB Input Current			1.15	1.4	mA
V_{FB}	Open Loop Voltage			4.5		V
R_{FB}	Input Impedance	FB Input Current = 0.1mA		2.4		kΩ
V_{DDZ}	V_{DD} Feedback Threshold Voltage*	FB Input Current = 0mA	20	22.7	25	V
		FB Input Current = 0.8mA	18	20	22	V

**The feedback input is pulled by a transistor that is controlled by the V_{DD} signal while $V_{DD} \geqq V_{DDZ}$.*

Current Sense Section

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
TPD	Propagation Delay			100		ns
VTH,VA	Current Limiting Valley Threshold Voltage for 65kHz	VDD = 20V	0.84	0.89	0.94	V
		VDD = 15V	0.72	0.77	0.82	V
		VDD = 10V	0.58	0.63	0.68	V
	Current Limiting Valley Threshold Voltage for 100kHz	VDD = 20V	0.76	0.81	0.86	V
		VDD = 15V	0.65	0.70	0.75	V
		VDD = 10V	0.52	0.57	0.62	V



Oscillator Section

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
F_{OSC}	SG6849–65 Frequency		60	65	70	kHz
F_{OSC}	SG6849–100 Frequency		92	100	108	kHz
$F_{OSC-G-BK}$	Green-Mode Burst Back Frequency*		20	25	30	kHz
$F_{OSC-G-OFF}$	Green-Mode OFF Frequency*			0		kHz
$I_{FB-G-OFF}$	Green-Mode OFF FB Input Current		0.9	1.15	1.4	mA
F_{DV}	Frequency Variation versus V_{DD} Deviation	V_{DD} = 10 to 20V			2	%
$V_{DD-TH-G}$	V_{DD}-Low Threshold Voltage for Exiting Green-Mode OFF		$V_{DD\ OFF}$+1.0	$V_{DD\ OFF}$+1.5	$V_{DD\ OFF}$+2.0	V

**Please see the "Green-Mode Burst Back ($F_{OSC-G-BK}$) and Green-Mode OFF Frequency ($F_{OSC-G-OFF}$) vs. V_{DD}" curves.*

Output Section

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
DCY_{MAX}	Maximum Duty Cycle		70	75	80	%
Bnk	Leading Edge Blanking Time			310		ns
V_{OL}	Output Voltage Low	V_{DD} = 15V, I_O = 10mA			1.5	V
V_{OH}	Output Voltage High	V_{DD} = 15V, I_O = 10mA	8			V
T_R	Rising Time	V_{DD} = 15V, C_L = 1nF		200		ns
T_F	Falling Time	V_{DD} = 15V, C_L = 1nF		80		ns
V_{CLAMP}	Output Clamp Voltage	V_{DD} = 20V		16.7	18	V

Over Temperature Protection (OTP)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Temp-Off	Protection Junction Temperature[*1]			150		°C
Temp-Restart	Restart Junction Temperature[*2]			130		°C

[*1] *When activated, the output is disabled and the latch is turned off.*

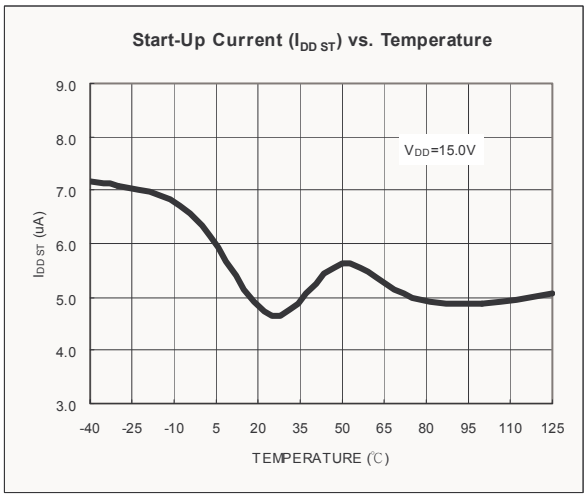
[*2] *This is the threshold temperature for enabling the output again and resetting the latch, after over temperature protection has been activated.*

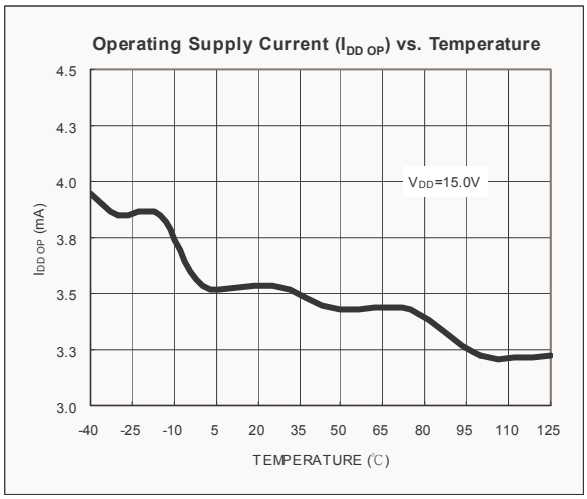
VDD Section

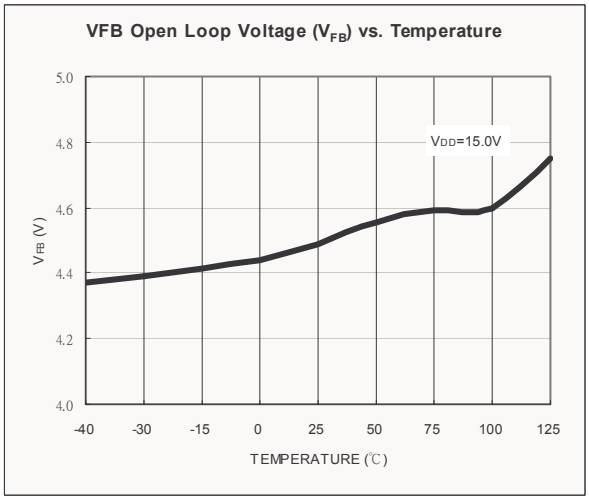
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{DD\ ON}$	Turn-On Threshold Voltage		16	17	18	V
$V_{DD\ OFF}$	Turn-Off Threshold Voltage		7.5	8	8.5	V
$I_{DD\ ST}$	Startup Current	V_{DD} = 15V		5	30	uA
$I_{DD\ OP}$	Operating Supply Current	V_{DD} = 15V GATE is Open		3.6	6	mA
$V_{DD\ CLAMP}$	Zener Diode Breakdown Voltage	I_{DD} = 10mA		28	30	V

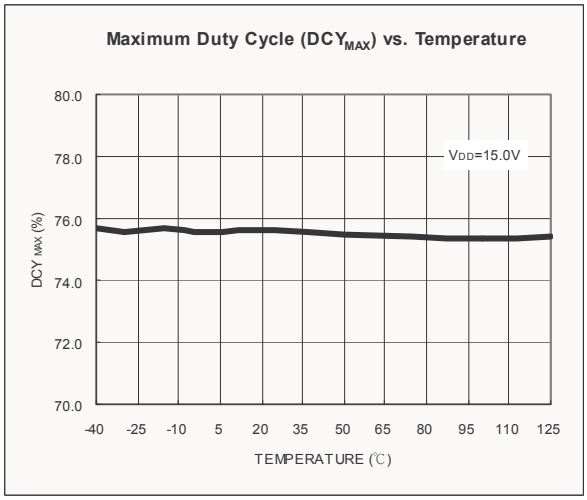
TYPICAL CHARACTERISTICS

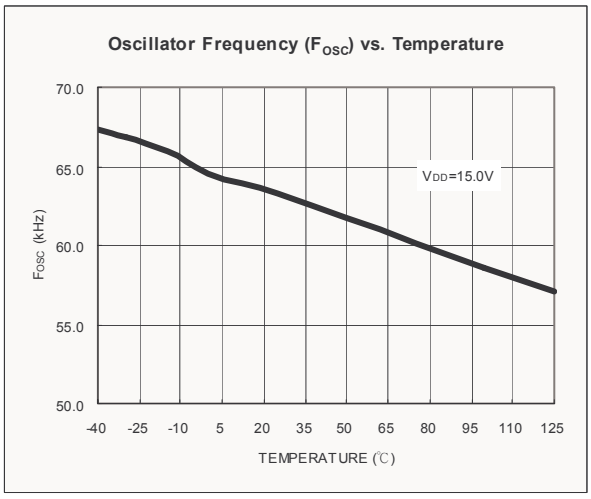
SG6849-65

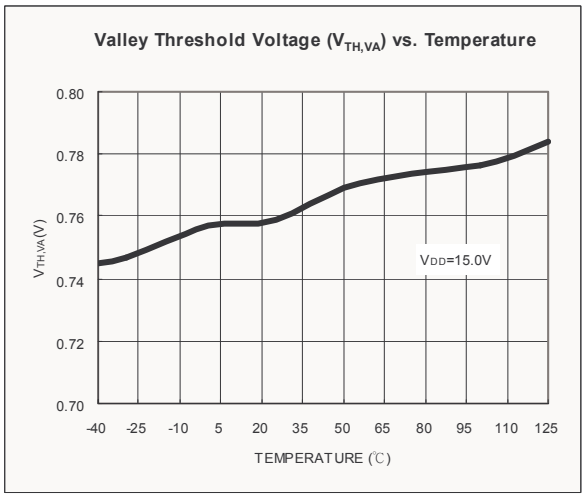


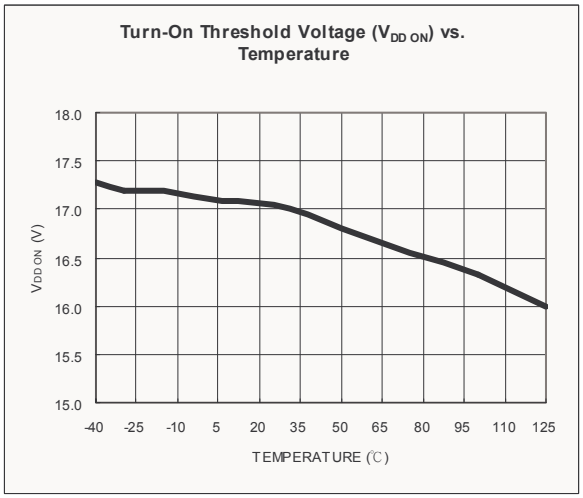


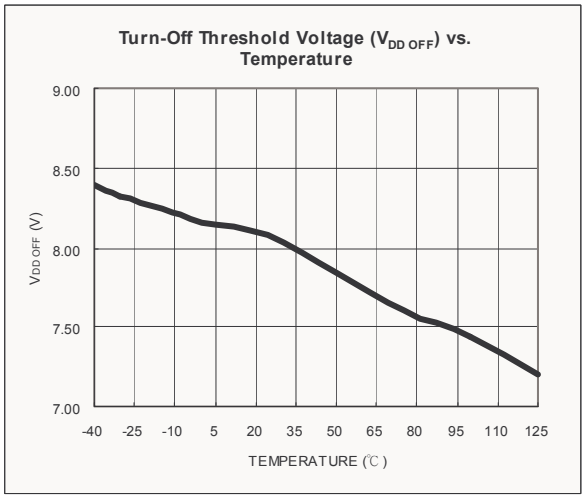


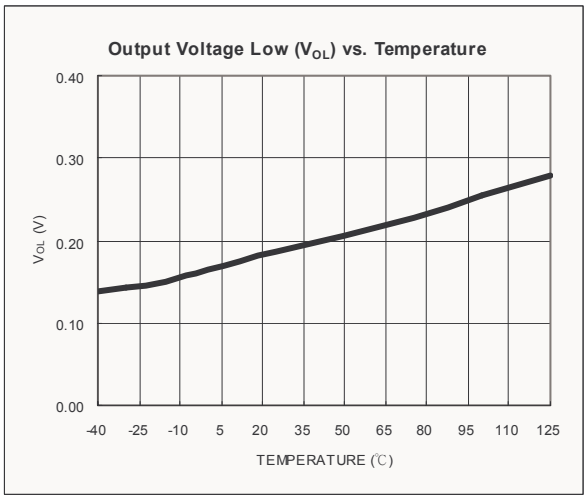


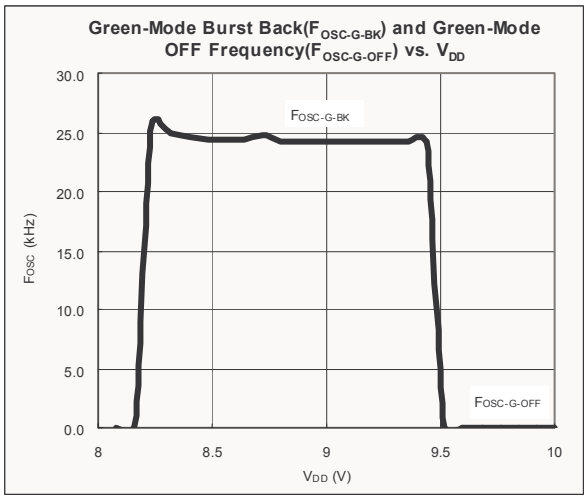


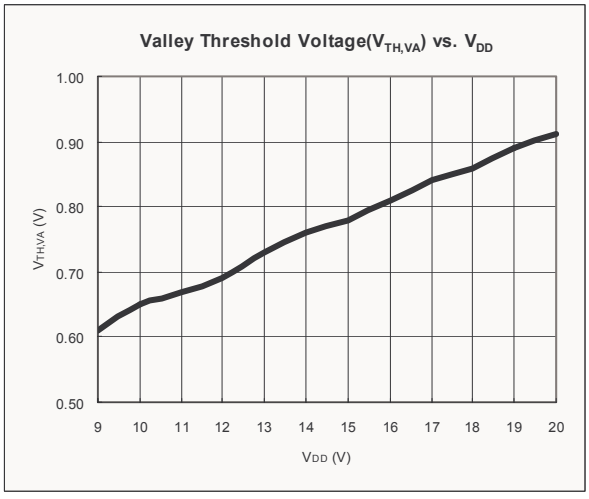


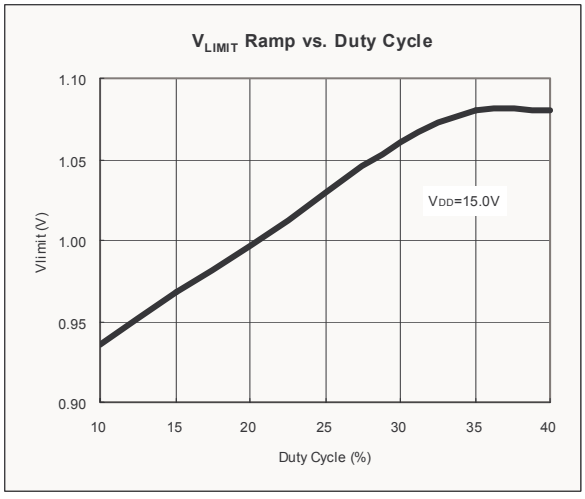

Turn-On Threshold Voltage ($V_{DD\ ON}$) vs. Temperature
$V_{DD\ ON}$ (V)
18.0
17.5
17.0
16.5
16.0
15.5
15.0
-40 -25 -10 5 20 35 50 65 80 95 110 125
TEMPERATURE (℃)


Turn-Off Threshold Voltage ($V_{DD\ OFF}$) vs. Temperature
$V_{DD\ OFF}$ (V)
9.00
8.50
8.00
7.50
7.00
-40 -25 -10 5 20 35 50 65 80 95 110 125
TEMPERATURE (℃)


Output Voltage Low (V_{OL}) vs. Temperature
V_{OL} (V)
0.40
0.30
0.20
0.10
0.00
-40 -25 -10 5 20 35 50 65 80 95 110 125
TEMPERATURE (℃)


Green-Mode Burst Back($F_{OSC-G-BK}$) and Green-Mode OFF Frequency($F_{OSC-G-OFF}$) vs. V_{DD}
F_{OSC} (kHz)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
$F_{OSC-G-BK}$
$F_{OSC-G-OFF}$
8 8.5 9 9.5 10
V_{DD} (V)


Valley Threshold Voltage($V_{TH,VA}$) vs. V_{DD}
$V_{TH,VA}$ (V)
1.00
0.90
0.80
0.70
0.60
0.50
9 10 11 12 13 14 15 16 17 18 19 20
V_{DD} (V)


V_{LIMIT} Ramp vs. Duty Cycle
Vlimit (V)
1.10
1.05
1.00
0.95
0.90
V_{DD}=15.0V
10 15 20 25 30 35 40
Duty Cycle (%)

OPERATION DESCRIPTION

SG6849 devices integrate many useful functions for low power switch mode power supplies. The following descriptions highlight the key features of the SG6849.

Startup Current

The required startup current is only 5uA. This allows a high-resistance, low-wattage startup resistor to be used to supply the controller's startup power. A 1.5 MΩ/0.25W startup resistor can be used over a wide input range (100V-240V AC) with very little power loss.

Operating Current

The operating current is normally 3.6mA. The low operating current results in higher efficiency and reduces the required V_{DD} hold-up capacitance. A 10uF/25V V_{DD} hold-up capacitor can be used over a wide input range (100V-240V AC) with very little power loss.

Green Mode Operation

The proprietary green-mode function provides off-time modulation to linearly decrease the switching frequency under light-load and zero-load conditions. The on-time is limited to provide better protection against brownouts and other abnormal conditions.

This green-mode function dramatically reduces power consumption under light-load and zero-load conditions. Power supplies using the SG6849 can easily meet international restrictions regarding standby power-consumption.

Constant Voltage (CV) and Constant Current (CC) without Feedback

The SG6849 can tightly regulate the output voltage and provide over current protection without requiring secondary-side feedback signals. For improved CV and CC accuracy, the transformer leakage inductance should be reduced as much as possible.

Over Temperature Protection (OTP)

The SG6849 has a built-in temperature sensing circuit to shut down PWM output once the junction temperature exceeds 150°C. While PWM output is shut down, the V_{DD} voltage will gradually drop to the UVLO voltage. Some of the SG6849's internal circuits will be shut down, and V_{DD} will gradually start increasing again. When V_{DD} reaches 17V, all the internal circuits, including the temperature sensing circuit, will start operating normally. If the junction temperature is still higher than 150°C, the PWM controller will be shut down immediately. This situation will continue until the temperature drops below 130°C. The PWM output will then be turned back on. The temperature hysteresis window for the OTP circuit is 20°C.

V_{DD} Over Voltage Clamping

V_{DD} over voltage clamping is built in to prevent damage from over-voltage conditions. When V_{DD} exceeds 22.7V, PWM output is shut down. Over-voltage conditions may be caused by an open photo-coupler loop or a short circuit in the output.

Oscillator Operation

The oscillation frequency is fixed at 65kHz for the SG6849-65, and at 100kHz for the SG6849-100.

Leading Edge Blanking

Each time the power MOSFET is switched on, a turn-on spike will inevitably occur at the sense-resistor. To avoid premature termination of the switching pulse, a 310ns leading-edge blanking time is built in. Conventional RC filtering is not necessary. During this blanking period, the current-limit comparator is disabled, and it cannot switch off the gate drive.

Constant Output Power Limit

When the SENSE voltage across the sense resistor R_S reaches the threshold voltage (around 1.0V), the output GATE drive will be turned off following a small

propagation delay T_{PD}. This propagation delay will introduce an additional current proportional to $T_{PD}*V_{IN}/L_P$. The propagation delay is nearly constant regardless of the input line voltage V_{IN}. Higher input line voltages will result in larger additional currents. Thus, under high input-line voltages the output power limit will be higher than under low input-line voltages.

Over a wide range of AC input voltages, the variation can be significant. To compensate for this, the threshold voltage is adjusted by adding a positive ramp. This ramp signal can vary from 0.77V to 1.05V for SG6849-65 and 0.70 to 1.03V for SG6849-100, and it flattens out at 1.05V and 1.03V respectively. A smaller threshold voltage forces the output GATE drive to terminate earlier, thus reducing total PWM turn-on time and making the output power equal to that of the low line input. This proprietary internal compensation feature ensures a constant output power limit over a wide range of AC input voltages (90VAC to 264VAC).

Under Voltage Lockout (UVLO)

The turn-on/turn-off thresholds of the SG6849 are fixed internally at 17V/8V. To enable the SG6849 during startup, the hold-up capacitor must first be charged to 17V through the startup resistor.

The hold-up capacitor will continue to supply V_{DD} before energy can be delivered from the auxiliary winding of the main transformer. V_{DD} must not drop below 8V during this startup process. This UVLO hysteresis window ensures that the hold-up capacitor can adequately supply V_{DD} during startup.

Gate Output

The SG6849 BiCMOS output stage is a fast totem pole gate driver. Cross-conduction has been avoided to minimize heat dissipation, increase efficiency, and enhance reliability. The output driver is clamped by an internal 16.7V Zener diode in order to protect the power MOSFET transistors against any harmful over-voltage gate signals.

Slope Compensation

The sensed voltage across the current sense resistor is used for current mode control and pulse-by-pulse current limiting. The built-in slope compensation function improves power supply stability. Furthermore, it prevents sub-harmonic oscillations that normally would occur because of peak current mode control. A positively sloped, synchronized ramp is activated by the SG6849 with every switching cycle. The slope of the ramp is

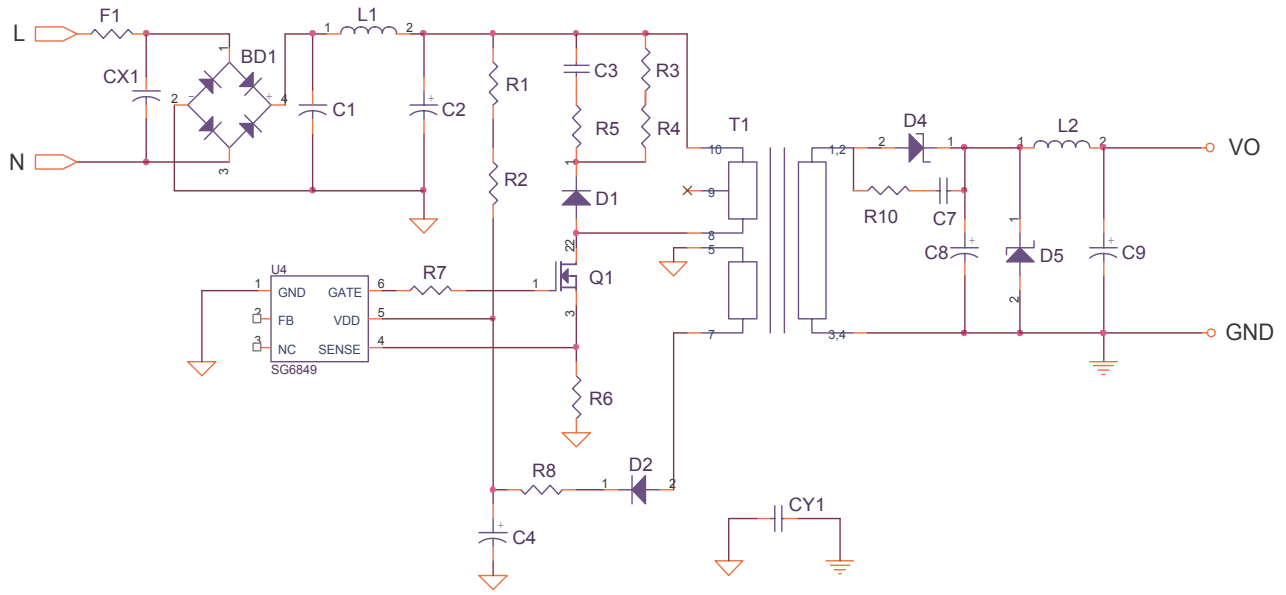
$$\frac{0.33 \times Duty}{Duty(\max)}.$$

Noise Immunity

Noise from the current sense or the control signal may cause significant pulse width jitter, particularly in continuous-conduction mode. Slope compensation helps alleviate this problem. Good placement and layout practices should be followed. The designer should avoid long PCB traces and component leads. Compensation and filter components should be located near the SG6849. Finally, increasing the power-MOS gate resistance is advised.

REFERENCE CIRCUIT

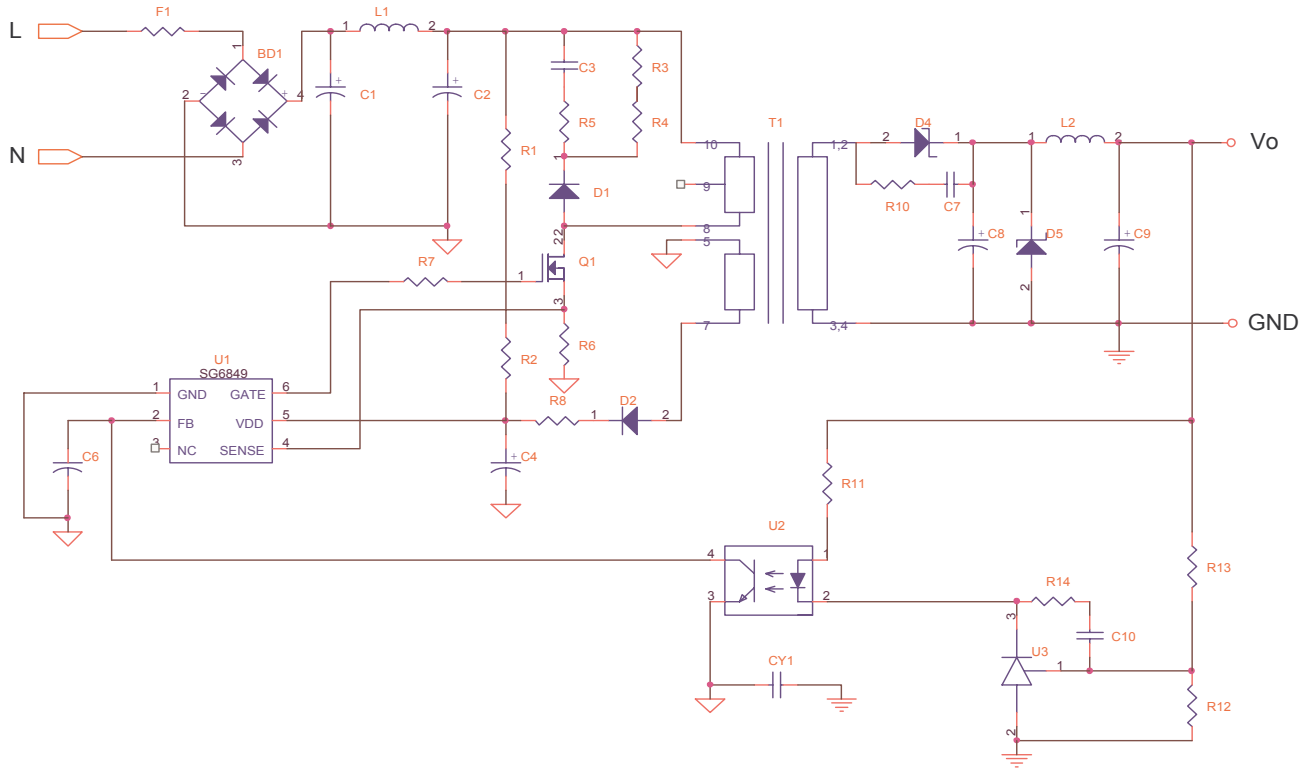
3W Flyback 5V/0.6A Circuit, without Secondary-Side Feedback



BOM

Symbol	Component	Symbol	Component
BD1	BD 1A/500V	L1	20mH 6*8mm
CX1 (Option)	YC 472pF/400V (Y1)	L2	10uH 6mm
CY1 (Option)	YC 102pF/400V (Y1)	Q1	MOSFET 1A/600V
C2	EC 10uF/400V 105℃	R1,R2	R 750kΩ 1206
C1	CC 103pF/500V	R3,R4	R 47kΩ 1206
C3	CC 1000pF/500V	R5	R 47Ω 1206
C4	EC 10uF/50V	R6	R 4.7Ω 1206
C7 (Option)	CC 102pF/100V 1206	R7	R 100Ω 0805
C8	EC 470uF/10V 105℃	R8	R 10Ω 1206
C9	EC 220uF/10V 105℃	R10 (Option)	R 10Ω 1206
D1	Diode FRI07	T1	EE-16
D2	Diode FR102	U4	IC SG6849 (Green PWM IC)
D4	Diode SB360		
D5 (Option)	ZD 6.8V 0.5W		
F1	R 1Ω/0.5W		

3W Flyback 5V/0.6A Circuit, with Secondary-Side Feedback

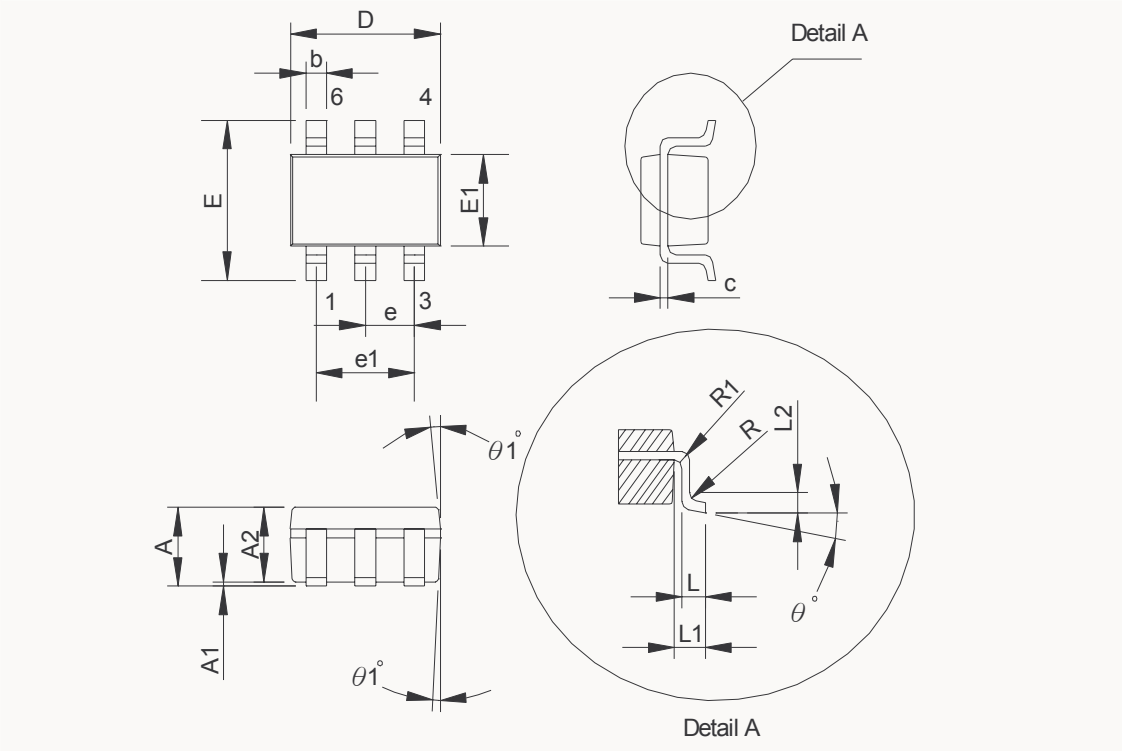


BOM

Symbol	Component	Symbol	Component
BD1 (Reference only)	DI106 1A/600V	L2	10uH 6mm
CY1 (Option)	YC 102p/400V	Q1	MOSFET 1A/600V
C2	10uF/400V 10Φ*16mm 105℃	R1,R2	750k 1206
C1	103p/500V (0.01uF/500V)	R4,R3	47k/1206
C3	1000p/500V CER	R5	47 1206
C4	10u/50V 5mm	R6	3.7 1206
C6	472p 0805	R7	100 0805
C7	102p/100V 1206	R10	10 1206
C8	470u/10V 8Φ*11.5mm 105℃	R8	5 1206
C9	470u/10V 8Φ*11.5mm 105℃	R11	100 1/8W
C10	222p 0805	R12	33k 0805
D1	FR107	R13	33k 1/8W
D2	FR102	R14	4.7k 0805
D4	SB360 (3A/60V; Schottky)	T1	EE-16
D5 (Option)	ZD/6.8V 0.5W	U1	SG6849 (Green PWM IC)
F1	1Ω1/2W Resistor	U2	PC817
L1	20mH 6*8mm	U3	TL431
BD1 (Reference only)	DI106 1A/600V	L2	10uH 6mm

PACKAGE INFORMATION

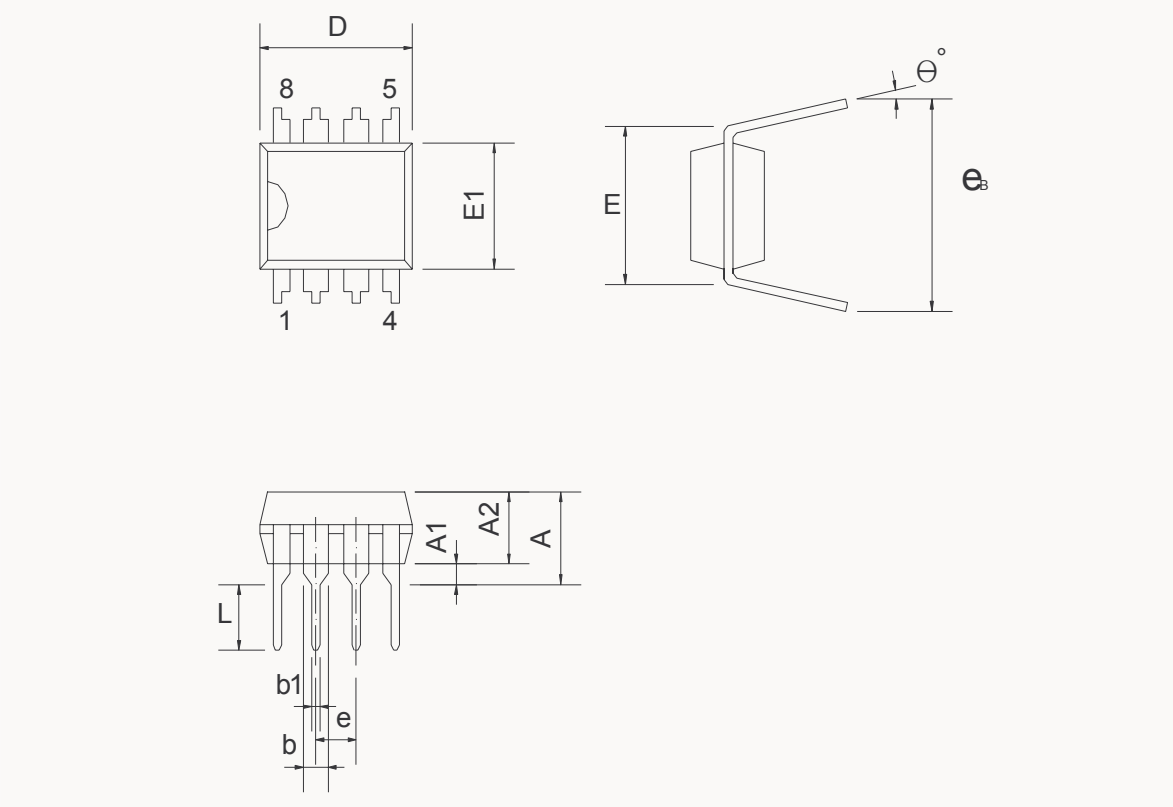
The SOT-26 Package



Dimensions:

Symbol	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.45			0.057
A1			0.15			0.006
A2	0.90	1.15	1.30	0.036	0.045	0.051
b	0.30		0.50	0.011		0.020
c	0.08		0.22	0.003		0.009
D		2.90			0.114	
E		2.80			0.110	
E1		1.60			0.063	
e		0.95			0.037	
e1		1.90			0.075	
L	0.30	0.45	0.60	0.020	0.018	0.24
L1		0.60			0.024	
L2		0.25			0.010	
R	0.10			0.004		
R1	0.10		0.25	0.004		0.25
θ°	0°	4°	8°	0°	4°	8°
θ1°	5°	10°	15°	5°	10°	15°

The DIP-8 Package



Dimensions:

Symbol	Millimeter			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.334			0.210
A1	0.381			0.015		
A2	3.175	3.302	3.429	0.125	0.130	0.135
b		1.524			0.060	
b1		0.457			0.018	
D	9.017	9.271	10.160	0.355	0.365	0.400
E		7.620			0.300	
E1	6.223	6.350	6.477	0.245	0.250	0.255
e		2.540			0.100	
L	2.921	3.302	3.810	0.115	0.130	0.150
e_R	8.509	9.017	9.525	0.335	0.355	0.375
θ°	0	7	15	0	7	15

DISCLAIMERS

LIFE SUPPORT

System General's products are not designed to be used as components in devices intended to support or sustain human life. Use of System General's products in components intended for surgical implant into the body, or other applications in which the failure of System General's products could create a situation where personal death or injury may occur, is not authorized without the express written approval of System General's Chief Executive Officer. System General will not be held liable for any damages or claims resulting from the use of its products in medical applications.

MILITARY

System General's products are not designed for use in military applications. Use of System General's products in military applications is not authorized without the express written approval of System General's Chief Executive Officer. System General will not be held liable for any damages or claims resulting from the use of its products in military applications.

RIGHT TO MAKE CHANGES

System General reserves the right to change this document and/or this product without notice. Customers are advised to consult their System General sales representative before ordering.